

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (currently amended) An illumination optical system for guiding light from a light source unit having a light-emitting element and a reflector, and an integrator unit which is downstream from the reflector and an image display light valve element downstream from the integrator, wherein at least one curved mirror is disposed between said integrator unit and said image display light valve element;

wherein said curved mirror is a parabolic mirror; and

wherein said parabolic mirror has a form, in a cross section including an optical path of the light from said light source unit to said image display light valve element, satisfying the following conditional expression (1) or (2):

$$f = \left\{ -L \pm L[1 + (\tan \theta)^2]^{1/2} \right\} / 2 \tan \theta \quad (1)$$

$$f = L/2 \quad (2)$$

where

$\theta \neq 90 + 180n$ (n being an integer) degrees in conditional

expression (1);

$\theta = 90 + 180n$ (n being an integer) degrees in conditional expression (2);

f is the focal length of the parabolic mirror (where $f > 0$);
L is the distance between the optical axis of luminous flux before reflection and z axis of the parabolic mirror; and
 θ is the optical axis bending angle caused by reflection of the parabolic mirror.

2 - 4. (canceled)

5. (previously presented) An illumination optical system according to claim 1, wherein said curved mirror is a hyperbolic mirror.

6. (currently amended) An illumination optical system according to claim 5, for guiding light from a light source unit having a light-emitting element and a reflector, and an integrator unit which is downstream from the reflector and an image display light valve element downstream from the integrator, wherein at least one curved mirror is disposed between said integrator unit and said image display light valve element;
wherein said curved mirror is a hyperbolic mirror;

wherein said hyperbolic mirror has a form, in a cross section including an optical path of the light from said light source unit to said image display light valve element, satisfying the following conditional expression (3):

$$z = C\rho^2 / [1 + (1 - KC^2\rho^2)^{1/2}] \quad (3)$$

where

z is the distance between the reflection point of the optical axis of luminous flux before reflection in the hyperbolic mirror and the tangent plane at the apex of the hyperbolic mirror;

ρ is the distance between the reflection point of the optical axis of luminous flux before reflection and z axis of the hyperbolic mirror;

C is a value defined as $C = a/b^2$ by a (where $a > 0$) and b satisfying the following conditional expressions (3-1) and (3-2); and

K is a value defined as $K = -a/b^2$ by a (where $a > 0$) and b satisfying the following conditional expressions (3-1) and (3-2);

$$8za^3 + 4(z^2 + \rho^2)a^2 - 2zL^2a - z^2L^2 = 0 \quad (3-1)$$

$$2(a^2 + b^2)^{1/2} = L \quad (3-2)$$

where

L is the focus-to-focus distance of the hyperbolic mirror defined by the following conditional expression (3-3):

$$L = \{[(Q - M)\sin \theta]^2 + [(P - M) - (Q - M)\cos \theta]^2\}^{1/2} \quad (3-3)$$

where

P is the focal length of the optical system upstream the hyperbolic mirror;

Q is the composite focal length of the optical system upstream the hyperbolic mirror and the hyperbolic mirror;

M is the distance from the optical system upstream the hyperbolic mirror to the hyperbolic mirror; and

θ is the optical axis bending angle caused by reflection of the hyperbolic mirror.

7. (cancel)

8. (original) A projection type image display apparatus comprising the illumination optical system according to claim 1.

9. (previously presented) An illumination optical system for guiding light from a light source unit to an image display light

valve element, wherein at least one curved mirror is disposed in an optical path of said illumination optical system,

wherein said curved mirror is a parabolic mirror, and

wherein said parabolic mirror has a form, in a cross section including an optical path of the light from said light source unit to said image display light valve element, satisfying the following conditional expression (1) or (2):

$$f = \left\{ -L \pm L[1 + (\tan \theta)^2]^{1/2} \right\} / 2 \tan \theta \quad (1)$$

$$f = L/2 \quad (2)$$

where

$\theta \neq 90 + 180n$ (n being an integer) degrees in conditional expression (1);

$\theta = 90 + 180n$ (n being an integer) degrees in conditional expression (2);

f is the focal length of the parabolic mirror (where $f > 0$);

L is the distance between the optical axis of luminous flux before reflection and z axis of the parabolic mirror; and

θ is the optical axis bending angle caused by reflection of the parabolic mirror.

10. (previously presented) An illumination optical system for guiding light from a light source unit to an image display light

valve element, wherein at least one curved mirror is disposed in an optical path of said illumination optical system,

wherein said curved mirror is a hyperbolic mirror, and wherein said hyperbolic mirror has a form, in a cross section including an optical path of the light from said light source unit to said image display light valve element, satisfying the following conditional expression (3):

$$z = C\rho^2 / [1 + (1 - KC^2 \rho^2)^{1/2}] \quad (3)$$

where

z is the distance between the reflection point of the optical axis of luminous flux before reflection in the hyperbolic mirror and the tangent plane at the apex of the hyperbolic mirror;

ρ is the distance between the reflection point of the optical axis of luminous flux before reflection and z axis of the hyperbolic mirror;

C is a value defined as $C = a/b^2$ by a (where $a > 0$) and b satisfying the following conditional expressions (3-1) and (3-2); and

K is a value defined as $K = -a/b^2$ by a (where $a > 0$) and b satisfying the following conditional expressions (3-1) and (3-2);

$$8za^3 + 4(z^2 + \rho^2)a^2 - 2zL^2a - z^2L^2 = 0 \quad (3-1)$$

$$2(a^2 + b^2)^{1/2} = L \quad (3-2)$$

where

L is the focus-to-focus distance of the hyperbolic mirror defined by the following conditional expression (3-3):

$$L = \{(Q - M)\sin \theta\}^2 + [(P - M) - (Q - M)\cos \theta]^2)^{1/2} \quad (3-3)$$

where

P is the focal length of the optical system upstream the hyperbolic mirror;

Q is the composite focal length of the optical system upstream the hyperbolic mirror and the hyperbolic mirror;

M is the distance from the optical system upstream the hyperbolic mirror to the hyperbolic mirror; and

θ is the optical axis bending angle caused by reflection of the hyperbolic mirror.

11. (previously presented) An illumination optical system according to claim 1, wherein a plurality of dichroic mirrors for separating a luminous flux from said integrator unit into three color components is disposed between said integrator unit and said image display light valve element, and guide said separated three color components to said image display light valve element

respectively, and further wherein said at least one curved mirror is disposed between said integrator unit and said dichroic mirrors.

12. (new) An illumination optical system according to claim 6, wherein a plurality of dichroic mirrors for separating a luminous flux from said integrator unit into three color components is disposed between said integrator unit and said image display light valve element, and guide said separated three color components to said image display light valve element respectively, and further wherein said at least one curved mirror is disposed between said integrator unit and said dichroic mirrors.

13. (new) An illumination optical system according to claim 9, wherein a plurality of dichroic mirrors for separating a luminous flux from said integrator unit into three color components is disposed between said integrator unit and said image display light valve element, and guide said separated three color components to said image display light valve element respectively, and further wherein said at least one curved mirror is disposed between said integrator unit and said dichroic mirrors.

14. (new) An illumination optical system according to claim 10,

wherein a plurality of dichroic mirrors for separating a luminous flux from said integrator unit into three color components is disposed between said integrator unit and said image display light valve element, and guide said separated three color components to said image display light valve element respectively, and further wherein said at least one curved mirror is disposed between said integrator unit and said dichroic mirrors.

15. (new) A projection type image display apparatus comprising the illumination optical system according to claim 6.

16. (new) A projection type image display apparatus comprising the illumination optical system according to claim 9.

17. (new) A projection type image display apparatus comprising the illumination optical system according to claim 10.